Optimization performance management with FCAPS and ITILv3: opportunities and obstacles

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ABSTRACT

With the need for rapidly growing network services each year; the factors of reliability, availability and quality become extremely critical for organizations, groups, institutions and governments to have in the network services implementation. In this case, several rural governments requires the improvement of its network performance management in establishing their internal and external operation to align with the grand design by the central government in improving citizen's satisfaction through public service. Testing was done using scenarios for output analysis and packet loss as parameters. The results of the proposed topology obtained a productivity of 541.43 Kbps and a packet loss of 0.07%. While the current topology gets a rate of 421.28 Kbps and packet loss of 0.22%. It can be concluded that the proposed topology is still better than the current topology. The optimization of performance management is based on the FCAPS method which emphasize in the performance monitoring and data analysis with the support of ITILv3 that contains documentation and policy guidance to conduct quality performance management. In addition, performance management activities will occur with processes in the design of ITIL services and existing conditions.

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1. INTRODUCTION

The potential of e-government is the technological motivation behind the emergence of networks as a guiding principle or rule for the government as a whole. All developed countries have begun to build ICT infrastructure that must be able to connect all government departments in the future. Recently, more services and electronic registrations have been designed and presented. The service quality of a network is a major factor because wired and wireless network data traffic has increased rapidly, with the continous growth has been forecasted to range from 40 percent to 50 percent annually on wired networks and in the range of 60 percent to 200 percent annually on wireless networks in this decade [1]. Therefore, there are many ways to improve the quality of government services, both the central government and public administration such as infrastructure development and resource improvement. Therefore the existence of a network infrastructure to communicate within the scope of government is very important, in which the existence of computer networks, the prospect of e-government will be easier to realize and established at the standard intended for the citizen satisfaction [2].

The main function of the ideal network management system is to improve the operational capabilities of the network. This means that the ultimate goal of network administration is to maintain network operations with the best performance. This is also considered during the design and reengineering of communication systems. Although the understanding of network performance is not very different between communication systems, this review is transferred exclusively to computer networks. It is important to keep

in mind that with new applications such as audio and video in computer networks, performance is the key variable for success, and if you can not achieve consistent performance, services are considered low value and of failure. In other cases, users only suffer from variable performance with intermittent application wait times that reduce productivity and user satisfaction. One of the main priorities is to maintain the integrity of the network, the state of the network and the performance from start to finish. The performance of the network is an important factor in communication links or nodes, protocols and traffic during transport. The protocol is the basis for the exchange of messages in or between the computer and communication systems, and may include signaling, authentication, detection and correction of errors. Data traffic or data traffic is data in a network. The type of protocol used and the traffic passing to the network represent challenges for the performance of the network. The means allow the transmission of information or traffic between connected entities and have an important role during the transfer of data to guarantee an efficient transmission. Nodes especially network devices, must be available, efficient and reliable to ensure that the network is capable of functioning [3].

Network management refers to activities, methods, procedures and tools related to the operation, administration, maintenance and provisioning of a network. High-end supercomputers increasingly rely on commodity components and there is no close integration between processors and networks. This often results in inefficiencies in sub-communication systems, such as program load height and message response time. To improve network performance, network monitoring can be carried out as an activity that enables organizations or network provider companies to check whether the network operates according to predetermined boundary values, track current conditions, and describe network conditions. This function is the basis for taking action and reacting to disturbances that occur on the network. In addition to reviewing the current infrastructure to find the suitable solutions, this study also present some challenges in implementing performance management and important issues that deserve investigation in future research activities in terms of opportunities and constraints. Existing topology in the rural government as shown in Figure 1.

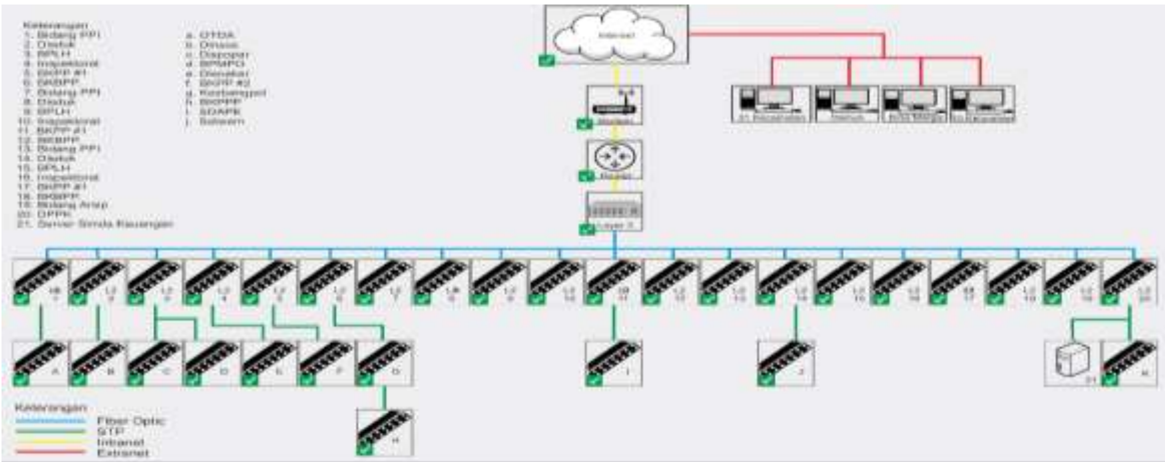

Figure 1. Existing topology in the rural government

2. LITERATURE REVIEW

In general, wireless sensor networks as the most promising technology that allow users to utilize devices that enable the access to information at any time any place that classified into tow categories, which are infrastructure-based and ad-hoc wireless networks with four categories according to their applications mobile ad-hoc networks (MANETS), wireless sensor networks (WSNs), wireless mesh networks (WMNs) and hybrid wireless networks [3, 19]. Traffic engineering is an important mechanism for Internet providers who want to improve network performance and deliver traffic by improving routing to find effective paths to achieve desired network performance [4]. However, optimizing the network configuration can improve the responsiveness by reducing latency in the IPv4 network, decreasing bandwidth consumption through simplifying network routing and services, predicting network performance and capacity needs by collecting baseline metrics for latency, packet loss and network availability before implementation begins, minimizing upload and download tmes for large files and attachment by efficiently migration process of legacy servers [6]. Therefore, the process of improvement in the network performance can support the attempt to protect the integrity of the data in the highly computerized and control system such as electoral

monitoring [7, 8], distributed machine learning, inventory control and virtualization [9-11]. In fact, network providers must implement any active traffic management, redirection, scheduling and screening policy that is usually carried out through the shortest route / lowest cost to the destination, the primary care service (FCFS) and the diameter of the tail. In a neutral network environment, all packages, regardless of the user and the service, are handled alone, since users compete with each other for resources. They do not protect users from each other, so greedy users can get a greater proportion of resources, while congestion problems are shared evenly [20].

The increased requirements for interoperability between distributed nodes has been demanded high-performance network connections due to significant growth in cloud computing and data centers. On the other hand, the input and output within network should be separated into the network resources into parts that can be managed from a particular server or device, provides effective consolidation and flexible management with high flexibility and scalability as well as cost and resource optimization [5]. There are different optimization-specific proxies' techniques at different layers of the protocol stack and their overall impact on application (web) performance, which are no proxy mode, transparent proxy mode and explicit proxy mode, with application level techniques such as dynamic content compression, HTTP optimization using pipelining, extended caching and delta encoding while at session layer through varying number of TCP connections, URL-rewriting/DNS-boosting and Server-side Parse-and-Push [12]. On the other hand, distributed storage systems often distribute data on multiple servers to distribute load and increase storage capacity, where application programmers can perform optimizations based on data access patterns to achieve performance assurance [13].

The edge-caching feature has received a lot of attention as an effective way to reduce delivery response time and network congestion during peak traffic time by collecting data to end users. Current work usually designs caching algorithms separately from the physical layer design [14]. Furthermore, WAN optimization has several functions including data, transport and application streamlining to reduce delay and jitter [15]. Moreover, TCP typically represent 85%-90% of fixed access Internet traffic and as much as 96% of mobile Internet traffic, which can be optimized by communications service providers (CSPs) by reducing the time to reach available bandwidth, maintaining available bandwidth, adapting changes in available bandwidth, handling packet loss in last-mile networks or handling congestion in last-mile networks to have higher average TCP transfer speeds, lower and more consistent TCP round-trip times, lower retransmission rates, increase goodput and improved network efficiency [16]. However, all new technologies that have been delivered to the organization have been paid dearly, in which the gap in IT is increasingly complicated by accelerating speed as it become wider and wider. Actually, IT professionals will use more tools to help increase visibility and security for the network where this happens, the next-generation packet strategists become strategic digital assistants because they can increase visibility, improve security and enable companies to increase the value of their investment in tools [17]. Hardware support for network reliability and remote memory request service is found to be a key factor in delivering better performance for small messages. It is recommended that the compiler-based communication scheduling may be required for optimal performance, especially for programs that require the use of asynchronous communication with many careful exchanges between optimization processes that rely heavily on the user's designated system [18].

3. RESEARCH METHODOLOGY

The application of the three-layered hierarchical model will be carried out in rural government where the core layer functions as a network backbone. Devices on this layer use routers or multilayer switches (layer 3 switches) and connect internal connections to the Internet (via ISP). This layer will provide several functions including providing high-speed connections, increasing routing efficiency, combining or uniting traffic from the distribution layer, avoiding attacks or interference from external to internal. With these needs, a device that can support functions is needed. The switch device used is the Cisco WS-C3560X-24P-S which runs on layer 3 and supports uplinks of up to 10 Gbps. For the needs of network protection the devices used are Sophos UTM 430 which has concurrent connection capacity of 8,000,000 compared to Sophos UTM 320 (UTM series currently in use) which only has concurrent connection capacity of 2,000,000. While the distribution layer functions to combine traffic from the access layer before being forwarded to the core layer and then to the Internet. The device used in this layer is a multilayer switch (switch layer 3) which has a role as a policy-based security with the principle of multi-layer for network protection from internal to external by using Access Control List (ACL) and filtering. In addition, this layer also provides redundant link and priority link using Spanning Tree Protocol (STP) for layer 2 and Hot Standby Router Protocol (HSRP) for layer 3. Next, there is also control of broadcast domains, because this layer's role is only as a demarcation point (layer) between layer 2 (access layer) and layer 3 (core layer).

The last thing is to do the summarization on interfaces that are connected to the core layer. At this layer the device used is Cisco WS-C2960XR-24PS-I which supports layer 3, has 24 ports, and 1 Gbps uplink. This device will be placed in 5 SKPD which are the distribution points. In its application, the access layer provides and is directly connected to the end device (user). The functions that will be given at this layer are managing bandwidth and implementing VLANs. At this layer the device to be used is Cisco WS-C2960 + 24TC-S which supports layer 2, has 24 ports and 1 Gbps uplink. In addition, the proposed topology for wireless changes in the core layer is no more links that are directly connected to the access layer from the backbone will be connected to the other 5 distribution backbone. At this layer the device used is the Routerboard 493G which has 9 GE ports and has a level 5 license. The device in the distribution layer serves to connect the access layer and core layer. Then the redundancy path is also at this layer. Changes to this layer are connected to each other at each distribution point. The device to be used is the Routerboard 493G which has 9 GE ports and has a license level 5. Then, the access layer will be directly connected to the end user (user) in each sub-district and kelurahan in the topology. Changes made are no more access points directly connected to the core layer. The device to be used is Mikrotik SXT 5HnD. In short, the methodology used in this research is consisted in three phases, which are network topology design, network simulation and service identification. Internal and external topology network as shown in Figure 3.

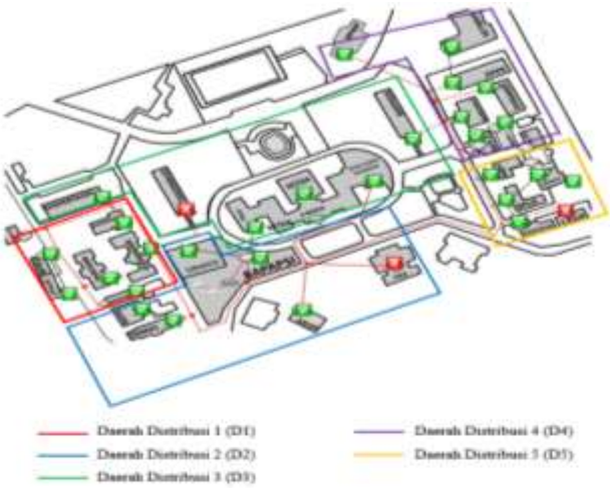

Figure 2. Floor plan of rural government

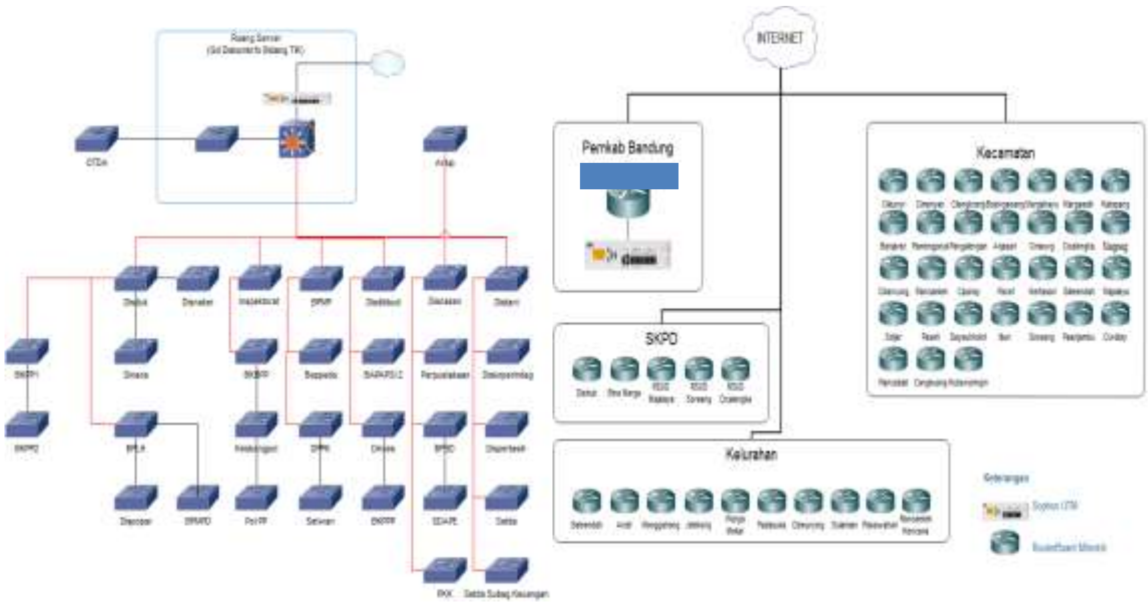

Figure 3. Internal (left) and external (right) topology network

List network devices as shown in Table 1. Sophos UTM 320, besides being used for the security of the Bandung Regency Government network, also functions as a router. So that the use of the device will be more efficient. Sophos UTM 320 is designed for middle-class business needs so it is very suitable for use by the Bandung Regency Government besides that the price-to-performance ratio of Sophos UTM 320 is also very good with such specifications. The D-Link switch has a total of 28 ports that can be used with 128 Gbps bandwidth. This switch is a type of stackable switch that can be combined with other switches that are stand alone. From this switch it is connected to 31 other switches in SKPD that are in the Bandung Regency Government complex. Subnets distribution as shown in Table 2.

Table 1. List Network Devices

Devices	Brands
UTM	Sophos UTM 320
Core switch	D-Link xStack DGS-3620-28SC
Access switch	D-Link DGS-1210-24

Table 2. Subnets Distribution

Subnet Name	Host	Prefix	IP Network	First IP	Last IP	IP Broadcast
D1	70	/25	10.87.5.0	10.87.5.1	10.87.5.126	10.87.5.127
D2	70	/25	10.87.5.128	10.87.5.129	10.87.5.254	10.87.5.255
D3	70	/25	10.87.6.0	10.87.6.1	10.87.6.126	10.87.6.127
D4	70	/25	10.87.6.128	10.87.6.129	10.87.6.254	10.87.6.255
D5	70	/25	10.87.7.0	10.87.7.1	10.87.7.126	10.87.7.127

4. ANALYSIS AND DESIGN

4.1. Testing Scenario

The purpose of the design of two network topology designs (wired and wireless) is to improve the quality of network services in rural government, especially in improving performance and facilitating or managing network infrastructure and services. Topology testing is done based on the proposed network topology which is done by performing video streaming broadcast from the server side to the user side. Then it will capture each existing RTP packet and analyze it to calculate throughput and packet loss for 170 hours 33 minutes 18 seconds with 916,836 packets with total 327.54 Mbytes (6,167,608 bits with 17.36 duration) to be compare with the current network that have throughput 421.28 kbps and packet loss of 0.22%. Meanwhile, in the simulated process, the RTP Packet total at 12865 with 9 lost RTP Packet. Wireshark summary as shown in Figure 4.

Figure 4. Wireshark summary

Throughput $= \frac{\text{Total Data Sent}}{\text{TIme to Sent Data}}$

Real $= \frac{6.167.608}{17.36} = 355.28$ Kbps   Simulated $= \frac{147.761.264}{272,909} = 541.43$ Kbps

Packet Loss $= \frac{\text{Data Packet Sent} - \text{Accepted Data Packet}}{\text{Total Data Sent}}$ x 100 %

Real $= \frac{303905-301778}{303905}$ Simulated $= \frac{12865-12856}{12865}$

$= 0.007$ x 100 % = 0.7 % $= \frac{9}{12865}$ x 100 % = 0.07 %

Uptime data is obtained according to the criteria based on PING's service on Nagios. There are many hosts whose uptime cannot reach the level set by the Rural Government (uptime is ≥ 90%). Of the many hosts that have an uptime percentage of ≤ 90%, there are 62 hosts out of 120 hosts or more than half have uptime for more than 90%. Therefore, if compared to the standard Tier Classification System good uptime on a network is ≥ 99.67% [23]. The number of hosts that have uptime of ≥ 99.67% is 0 out of 120 hosts. This proves that the uptime that is owned is still far from the standard. Most of these 62 hosts are sub-districts, villages, and SKPD that are outside the Bandung regency complex. Some hosts even have uptime = 0% such as Arjasari, Baleendah, Bangkuang, and the Department of Transportation. While 58 hosts that have an uptime percentage of ≥ 90% are mostly SKPD in the Bandung Regency government complex such as Bappeda (Development Planning Agency at Sub-National Level), BKPP (Staffing, Education and Training Agency), BPPD (Regional Revenue Management Agency), BPMPD (Community and Village Government Empowerment Agency) and the Health Office. This indicates the need for increased and even distribution of network performance, especially on the external network of Bandung Regency Government complex so that the service of the Bandung Regency Government can be even better in the future.

Table 3. Availability Report in the Rural Government Network

Host	*Uptime Total*	*Uptime Percentage*	*Host*	*Uptime Total*	*Uptime Percentage*
BPLH	579336	95.790%	Fp_binamarga	0	0.000%
Bapapsi	594996	98.379%	Google	578928	95.722%
Bapapsi2	590627	97.657%	Inspektorat	599189	99.072%
Bappeda	592723	98.003%	Kesbangpol	595670	98.490%
Bkbpp	593256	98.091%	Mikrotik_Arjasari	0	0.000%
Bkpp1	595650	98.487%	Mikrotik_Baleendah	594529	98.302%
Bkppp	585544	96.816%	Mikrotik_Banjaran	251225	41.539%
Bpbd	589153	97.413%	Mikrotik_Bojongsoang	550914	91.090%
Bpmp	593175	98.078%	Mikrotik_Cangkuang	537204	88.823%
Bpmpd	561937	92.913%	Mikrotik_Cikancung	589440	97.460%
Core	593004	98.050%	Mikrotik_Cilengkrang	485663	80.301%
Depo_Arsip	174077	28.783%	Mikrotik_Cileunyi	422631	69.879%
Dinkes	591009	97.720%	Mikrotik_Cimaung	345539	57.133%
Dinsos	557638	92.202%	Mikrotik_Cimenyan	557709	92.214%
Disdikbud	593368	98.110%	Mikrotik_Ciparay	541742	89.574%
Disdukcapil	592432	97.955%	Mikrotik_Ciwidey	526953	87.128%
Diskoperindag	592437	97.956%	Mikrotik_Dayeuhkolot	0	0.000%
Disnakan	592685	97.997%	Mikrotik_Dishub	0	0.000%
Disnaker	591828	97.855%	Mikrotik_Ibun	0	0.000%
Dispertasih	594972	98.375%	Mikrotik_K.Rancaekek_kencana	520675	86.090%
Dispopar	591276	97.764%	Mikrotik_Katapang	592714	98.002%
Distanbunhut	592709	98.001%	Mikrotik_Kertasari	548832	90.746%
Dppk	593555	98.141%	Mikrotik_Kutawaringin	592742	98.006%
Dsdape	379067	62.676%	Mikrotik_Majalaya	474669	78.484%
FpCangkuang	0	0.000%	Mikrotik_Margaasih	582473	96.308%
Fp_Arjasari	0	0.000%	Mikrotik_Margahayu	535151	88.484%
Fp_Baleendah	589750	97.512%	Mikrotik_Nagreg	465679	76.997%
Fp_Banjaran	7610	1.258%	Mikrotik_Pacet	404644	66.905%
Fp_Bojongsoang	563085	93.103%	Mikrotik_Pamengpeuk	561251	92.799%
Fp_Cangkuang	0	0.000%	Mikrotik_Pangalengan	0	0.000%
Fp_Cicalengka	512577	84.751%	Mikrotik_Paseh	302245	49.974%
Fp_Cikancung	0	0.000%	Mikrotik_Pasirjambu	504298	83.383%
Fp_Cilengkrang	496041	82.017%	Mikrotik_Rancabali	0	0.000%
Fp_Cileunyi	0	0.000%	Mikrotik_Rancaekek	467227	77.253%
Fp_Cimaung	346948	57.366%	Mikrotik_Rsud.Cicalengka	565085	93.433%
Fp_Cimenyan	541212	89.486%	Mikrotik_Rsud.Majalaya	542900	89.765%
Fp_Ciparay	0	0.000%	Mikrotik_Solokanjeruk	574605	95.007%
Fp_Ciwidey	534110	88.312%	Mikrotik_Soreang	0	0.000%
Fp_Dayeuhkolot	0	0.000%	Mikrotik_binamarga	0	0.000%
Fp_Dishub	0	0.000%	Mikrotik_cicalengka	528370	87.363%

Host	*Uptime Total*	*Uptime Percentage*	*Host*	*Uptime Total*	*Uptime Percentage*
Fp_Ibun	0	0.000%	Mikrotik_rsud_Soreang	540199	89.319%
Fp_K.Rancaekek_kencana	0	0.000%	Otda	590956	97.711%
Fp_Katapang	591680	97.831%	Perpustakaan	438675	72.532%
Fp_Kertasari	554631	91.705%	Pkk	159366	26.350%
Fp_Kutawaringin	0	0.000%	PolPP	589459	97.463%
Fp_Majalaya	479824	79.336%	Server_Arsip	602198	99.570%
Fp_Margaasih	574241	94.947%	Server_DB_PTSP	602198	99.570%
Fp_Margahayu	173117	28.624%	Server_Dpmptsp	601934	99.526%
Fp_Nagreg	465060	76.895%	Server_Jdih	602198	99.570%
Fp_Pacet	0	0.000%	Server_Proxmox	602198	99.570%
Fp_Pamengpeuk	0	0.000%	Server_SMS_GW	602198	99.570%
Fp_Pangalengan	0	0.000%	Server_Simpeg	602198	99.570%
Fp_Paseh	0	0.000%	Server_WebServices	602198	99.570%
Fp_Pasirjambu	0	0.000%	Setda	592680	97.996%
Fp_Rancabali	0	0.000%	Setda_keuangan	587944	97.213%
Fp_Rancaekek	476387	78.768%	Setwan	591020	97.722%
Fp_Rsud.Cicalengka	0	0.000%	Sophos	593605	98.149%
Fp_Rsud.Majalaya	0	0.000%	bkpp2	593880	98.194%
Fp_Solokanjeruk	0	0.000%	fp_rsud_Soreang	575119	95.092%
Fp_Soreang	0	0.000%			

In measuring the average response time obtained is 0.7877 seconds or it can be said that it does not have a good response time. From the sample data no one has a good response time (<0.1 seconds), 82 samples that have a poor response time (0.1 - 0.5 seconds), and 18 samples that have a bad response time (> 0.5 seconds). This test is carried out on the network of internal rural government precisely in the ICT field at peak times, namely at 10:00 - 14:00 WIB. In this test the packet response time is measured by using 200 captured packet samples. Meanwhile, the average response time obtained is 0.5049 seconds or it can be said that it does not have a good response time. From the sample data no one has a good response time (<0.1 seconds), 91 samples that have a poor response time (0.1 - 0.5 seconds), and 9 samples that have a bad response time (> 0.5 seconds). This test is carried out in the same field in the assumed free time at 16.00 - 18.00 WIB with 200 samples as well, which overall, the duration take a week. Responses time graphs as shown in Figure 5.

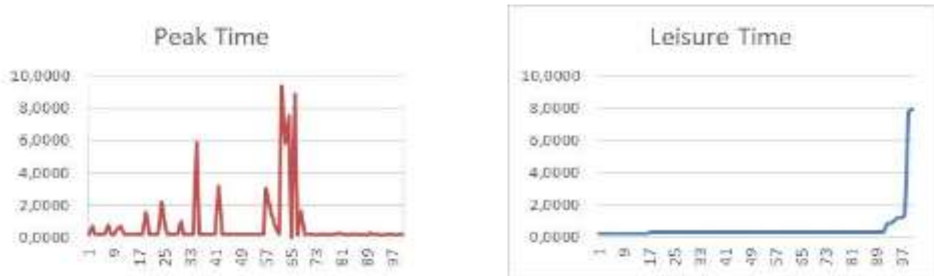

Figure 5. Responses time graphs

The first thing to do is to ensure the handling of network performance is in accordance with the SOP or work instruction. This design is made according to the proposed performance management cycle. Then for its implementation it must be ensured that every activity that uses network services is in accordance with what has been designed. Then, defining the threshold for network performance where it is needed as a reference that the state of network performance is still in accordance with the needs of network services. Defining the threshold is very helpful when it is necessary to handle or adjust the network conditions and when there is no need for handling or adjusting to network conditions. Every network activity monitored (device, network, service) provides notification (can be a report) that can be displayed on end device devices by sending network performance notifications to higher-level applications automatically or not automatically. In addition there must also be adjustments or reset network configuration based on changes that occur. This aims to improve network performance. Changes, adjustments, or rearrangements made are not only limited to software but can be done on existing hardware (network devices). Quality assurance is very important for performing performance management, monitoring, testing, and controlling risks that exist in network services. Proposed performance monitoring process as shown in Table 4.

Table 4. Proposed Performance Monitoring Process

No	*Policy Domain*
Device-related Performance Monitoring	
1	*Measurement towards the utilization of CPU on the device*
2	*Establish link monitoring towards link connected to each device*
3	*Establish traffic monitoring to every running application*
Network Performance Monitoring	
1	*Measurement towards response time*
2	*Measurement towards throughput*
3	*Measurement towards delay*
4	*Measurement towards packet loss*
5	*Path monitoring in the network utilization*
Service Performance Monitoring	
1	*Establish traffic monitoring in every server*
2	*Identification toward the majority process in the network traffic*
3	*Traffic monitoring in each service process*

Baselining results are then used to determine policies at the performance management stage such as determining thresholds. In addition to baselining, the data analysis stage also analyzes the report based on the results of performance monitoring which is also intended to determine the policies carried out at the stage of performance management. Baselining network performance as shown in Table 4.

Table 5. Baselining Network Performance

Current Condition	Realization Target
Packet loss = 0,22 %	Packet loss = < 0,5 %
Response time = 1,1786 seconds	Response time = < 0,1 seconds
CPU Utilization for the Sophos device in the average more than (>) 80 %	CPU utilization for the Sophos device less than (<) 80%
Performance monitoring only conducted to monitor response time	Performance monitoring can evaluate the performance of device, network and service

4.2. Service Design

The main challenges we face today are how to make better use of our knowledge and experience in implementing policies in the formulation of real policies, together with how to achieve optimal social impact with relatively limited public resources. While the government is responsible for public services, the public service does not necessarily provide it only for the government. In many services, the government is the player and the partner and not necessarily the main provider. The implementation of policies changes constantly and becomes more complex as more and more players participate. While governments need to make markets prosper, entrepreneurs make them vibrant. The challenge of implementing the policy becomes an opportunity to engage with businesses, academics and non-profit organizations in a way that promotes private and public benefits to each other in a positive cycle. In an effort to solve these complex challenges, the administration process should consider the potential for cooperation between the Government and the service design sector. In the development of public services, effectiveness, legitimacy and transparency are very important, and it is necessary to be able to position oneself in other disciplines and understand the language and methods of the other.

The acceptance of public services is essential, as is the design of those services that have the greatest impact and the highest level of public trust [21]. The application of FCAPS to determine technical policy requires a framework in implementing policies that are workflow or business processes as a reference in managing network performance in Rural Government. Therefore ITIL Service Design is needed to design all processes in managing network performance. Each activity carried out produces output in the form of documents. In the design of services, the main scenario is where results and experiences are reflected through several nodes and interfaces, so we design behaviors and interactions so that everything works well, as promised. But things fail, and when you do it is not good if users are vulnerable to all kinds of harassment and additional burdens that are the cash equivalent of penalties and surcharges. The results become what they pay, and experience becomes what they pay for. Therefore, the service design of public services should be allowed to have a more attractive price in terms of not having to pay hidden costs in the form of an appalling experience. For example, it should be easy to obtain licenses, permits or other or authorization, without the unnecessary burden of completing the forms, or providing all the evidence or waiting long to make decisions [24, 25]. Therefore, the increasingly complex service environment lead to the attempt to collaboratively create value through webs of interactions between provider and customer within the respected networks [22].

Table 6. Proposed Service Design Policy

Domain	Keterangan	Realisasi Usulan
Service Catalogue Management		
Service Catalogue	Contains details and current conditions of each service and the relationship between services that have been carried out.	Output in the form of a document that contains details of each service.
Documentation and service agreement	Explanation of each service performed.	The output is an explanation document for each service.
Renewable service portfolio	Contains updated information about changes that exist in the service.	Output in the form of update information document changes to service
Service Level Management		
Service Reports	Provide details of service levels achieved and compare with predetermined targets.	The output is in the form of a detailed service level document achieved with a predetermined target.
Service Improvement Plan	All related services that need improvement cover the entire process and associated risks and impacts.	Output in the form of documents that contain data services that need improvement
Service Level Aggreements (SLA)	The value or level at which the service is said to meet the needs for each service operation.	Output in the form of an SLA document for each agreed service operation.
Service Level Requirements (SLR)	Designing acceptance criteria needs for proposed new services or changes to existing services.	Output in the form of an SLR document for each proposed new service or change to an existing service.
Operational Level Aggreements (OLA)	Criteria for teams that handle network performance management.	The output is an OLA document for each agreed team member.
Capacity Management		
Capacity Mgmt Inf. System (CMIS)	Collect data from all processes and services that are carried out to determine the required infrastructure components and increase components for the future.	Output in the form of data documents from all existing services.
Service performance information and reports	Provides information on the performance of each service that is run. In addition to determining the steps in performance management, this activity is also used to assist in the process of identifying the financial budget needs for new infrastructure or components.	Output in the form of a report containing information on each service that is run.
Forecasts and predictive reports	Used to predict future IT scenarios that are used to establish long-term and short-term plans.	Output in the form of a report containing predictions of future network services.
Availability Management		
Availability Mgmt IS (AMIS)	Used to store data related to availability.	Output berupa dokumen AMIS.
Service availability, reliability and maintainability reports	Provides information about the availability, reliability and treatment of services that are carried out.	Output is an AMIS document.
IT Service Continuity Management		
Risk analysis and management reviews and reports	Conduct analysis and review of each service that is carried out.	Output is a report that contains a review and analysis for each service that is being run.

5. CONCLUSION

Nowadays technological solutions are getting outdated very fast, which applies to networking industry as well. Thus, the optimization strategy should be conduted to obtain effective utilizaztion of resources. The organization should present a set of expectation criteria of the work performance intended through agreeable planning to monitor the internal and external process with threshold point. It can be achieved by offering rewards and praise for good performance while addressing the poor through cut-off strategy or improvement program. The continuous and regular process with summaries and review can evaluate the degree of performance of each analysis to develop a capacity for optimal performance. Based on the research carried out in the Analysis and Optimization of Network Infrastructure in Rural Government using the FCAPS Framework, the following conclusions can be drawn that wired and wireless topologies have not applied the standards for overall topology design so that the application of Cisco three-layered hierarchical models can optimize internal network performance and external. At present performance management activities are still not maximized because current management is only limited to availability. Based on the results of the analysis, this study will produce a design of performance management activities using the FCAPS framework. Based on the identification of the absence of a reference to the process of implementing good performance management is one of the obstacles to network management in Bandung Regency Government. Based on this identification, this study will produce a reference standard for the implementation of performance management based on ITIL service design.

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